

IN THE CLAIMS

1. (Currently amended) A method for forming a composite oxide layer having a first thickness in an integrated circuit device, the method comprising:

growing a thermal oxide layer having a second thickness thinner than the first thickness on a surface of a semiconductor substrate in a chemical vapor deposition (CVD) apparatus, wherein the surface of the semiconductor substrate comprises a bottom and a sidewall of a trench formed by etching the substrate to a predetermined depth;[[and]]

forming a CVD oxide layer directly on the thermal oxide layer in the CVD apparatus after growing the thermal oxide layer, the CVD oxide layer having a third thickness substantially equal to a difference between the first thickness and the second thickness;

forming a nitride liner layer on the CVD oxide layer in the CVD apparatus; and

forming a trench filling layer on the nitride liner layer in the CVD apparatus.

2. (Original) The method of claim 1, wherein the thermal oxide layer is formed to a thickness of approximately 20Å to 100Å.

3. (Previously presented) The method of claim 1, wherein the CVD oxide layer is formed of a material selected from the group consisting of silicon oxide, aluminum oxide, zirconium oxide, and tantalum oxide.

4. (Cancelled)

5. (Previously presented) The method of claim 1, wherein growing a thermal oxide layer comprises using O₂, N₂O or a combination thereof for an oxidizing ambient.

6. (Original) The method of claim 1, wherein growing a thermal oxide layer is carried out at a temperature of approximately 750°C to 1000°C.

7. (Previously presented) The method of claim 1, wherein growing a thermal oxide layer is carried out at a temperature of approximately 750°C to 1000°C and forming a CVD oxide layer is carried out at a temperature of approximately 700°C to 850°C.

8. (Currently amended) The method of claim 1, wherein the surface of the semiconductor substrate comprises a bottom and a sidewall of a trench formed by etching the substrate to a predetermined depth; and

—wherein the thermal oxide layer is formed to a thickness of approximately 20Å to 100Å, and the CVD oxide layer is formed to a thickness of approximately 50Å to 400Å.

9. (Previously presented) The method of claim 8, wherein the CVD oxide layer is formed of a material selected from the group consisting of silicon oxide, aluminum oxide, zirconium oxide, and tantalum oxide.

10. (Previously presented) The method of claim 8, wherein growing a thermal oxide layer uses O₂, N₂O or a combination thereof as a source gas at a temperature of approximately 750°C to 1000°C, and forming a CVD oxide layer is carried out using N₂O and SiH₄ as source gases at a temperature of approximately 700°C to 850°C.

11. (Currently amended) The method of claim 8, further comprising: forming[[a]] the nitride liner layer on the CVD oxide layer in the CVD apparatus to a thickness of approximately 30Å to 100Å[[.]] and forming [[a]]the trench filling layer on the nitride liner layer in the CVD apparatus to a thickness of approximately 3000Å to 10000Å.

12-14. (Cancelled)

15. (Previously presented) A method of forming an integrated circuit device, comprising:

forming a trench in a single crystalline silicon substrate by etching;

forming a composite oxide layer of a double layer structure with a first thickness on a surface of the trench;

forming a nitride liner layer on the composite oxide layer,

wherein forming the composite oxide layer comprises:

forming a thermal oxide layer having a second thickness of 20 Å to 100 Å on the trench;

forming a CVD conformal liner material layer directly on the thermal oxide layer, the CVD conformal liner material layer having a third thickness substantially equal to a difference between the first thickness and the second thickness wherein the thermal oxide layer, the CVD conformal liner material layer, and the nitride liner layer are formed in the same chemical vapor deposition (CVD) apparatus,

and wherein a thickness of 8.8 Å to 44 Å of the single crystalline silicon substrate is consumed during the forming of the thermal oxide layer.

16. (Cancelled)

17. (Previously presented) The method of claim 15, wherein the CVD conformal liner material layer is formed to a thickness of 50Å to 400Å.

18. (Previously presented) The method of claim 15, wherein the CVD conformal liner material layer is made of a material selected from the group consisting of silicon dioxide, aluminum trioxide, zirconium oxide, and tantalum pentoxide.

19. (Cancelled)

20. (Previously presented) The method of claim 15, wherein the thermal oxide layer is formed using O₂, N₂O or a combination thereof as a source gas at a temperature of approximately 750°C to 1000°C, and the CVD conformal liner material layer is a high temperature oxide layer formed using N₂O and SiH₄ as a source gas at a temperature of approximately 700°C to 850°C.

21. (Original) The method of claim 20, further comprising: forming a trench isolation material on the nitride liner layer in the same CVD apparatus to fill the trench.

22. (Previously presented) A method of forming an isolation trench, comprising: etching a single crystalline silicon substrate to form a trench therein;

forming a composite oxide layer having a double layer structure with a first thickness on a surface of the trench; and

forming a nitride liner layer on the composite oxide layer; and forming a trench isolation material layer on the nitride liner layer to fill the trench,

wherein forming the composite oxide layer comprises:

forming a thermal oxide layer having a second thickness of 20 Å to 100 Å on the trench;

forming a CVD conformal liner material layer directly on the thermal oxide layer, the CVD conformal liner material layer having a third thickness substantially equal to a difference between the first thickness and the second thickness,

whercin the thermal oxide layer, the CVD conformal liner material layer, and the nitride liner layer, and the trench isolation layer are formed in the same chemical vapor deposition (CVD) apparatus,

and wherein a thickness of 8.8 Å to 44 Å of the single crystalline silicon substrate is consumed during the forming of the thermal oxide layer.

23. (Cancelled)

24. (Previously presented) The method of claim 22, wherein the CVD conformal liner material layer is formed to a thickness of 50Å to 400Å.

25. (Previously presented) The method of claim 22, wherein the thermal oxide layer is formed using O₂, N₂O or a combination thereof as a source gas at a temperature of approximately 750°C to 1000°C, and the CVD conformal liner material layer is a higher temperature oxide layer formed using N₂O and SiH₄ as a source gas at a temperature of approximately 700°C to 850°C.

26. (Previously presented) The method of claim 22, wherein the CVD conformal liner material layer is made of a material selected from the group consisting of silicon oxide, aluminum oxide, zirconium oxide, and tantalum oxide.

27-28. (Cancelled)